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included the following: "Outlines of Theoretical Chemistry," by Dr. F. H. Getman (John Wiley & Sons), which is in its second edition and has been revised and enlarged, notably with respect to atomic structure, colloids, electromotive and photochemistry which has, no doubt, added to the usefulness of a work already respected. The literature relating to colloids has been extended by a second edition of Dr. M. H. Fischer's translation of Wolfgang Ostwald's "Handbook of Colloid-Chemistry" (P. Blakiston's Son & Co.), to which "Notes" have been added by Emil Hatschek, but without essential change in the nature of the material. A further new work is that entitled "The Chemistry of Colloids," by Dr. E. B. Spear (John Wiley & Sons), Part I. of which is a translation of Zsigmondy's "Kolloid-chemie," and Part II. is on "Industrial Colloidal Chemistry," written by Dr. Spear, with a chapter on "Colloidal Chemistry and Sanitation," by Dr. J. F. Norton. The subject is brought up to date in an easily readable fashion and is of interest to both the general and technical reader. Dr. F. P. Venable in his "Brief Account of Radio-activity" (D. C. Heath & Co.) has contributed in about fifty pages an entertaining and somewhat popularized summary of the phenomena of radio-activity and their influence upon our notions of atomic structure.

The editor's table contained but one volume on industrial chemistry, now become familiar, namely, Dr. Allen Roger's "Elements of Industrial Chemistry" (D. Van Nostrand Co.), an abridgment of the larger work by Rogers and Aubert. Both have an established place in chemical literature.

The fact that Dr. Phillip B. Hawk's "Practical Physiological Chemistry" (P. Blakiston's Son & Co.) has reached its sixth edition is sufficient evidence of its usefulness in "schools of medicine and science" for which it was written. The entire work has been revised and brought up to date.

"The Chemistry of Farm Practice," by T. E. Keitt, which is included in the Wiley Technical Series, has for its purpose the imparting of a "knowledge of the fundamental

chemistry required for intelligent agriculture" and its applications to the art and to the problems of the agriculturist. The story is told in non-technical language. In the same field there has appeared a "Laboratory Manual of Agricultural Chemistry" by Hedges and Boyant which is apparently a useful little book for agricultural institutions, although open to some criticism as to the accuracy of some of its methods for the standardization of volumetric solutions.

A distinct contribution to contemporary literature is to be found in Dr. F. J. Moore's "History of Chemistry" (McGraw-Hill Book Co.), a volume which holds the interest alike of the layman and the scientist, and deals with its subject in a scholarly fashion.

In line with the current effort to supplant German reference works by English equivalents, "The Chemist's Year Book" for 1918-1919, edited by F. W. Atack (Sherratt & Hughes, London), is worthy of note. The present is the fourth edition of this work and is the result of a thorough revision of the last edition. It seems to deserve a place in all laboratories and libraries.

Finally, and again in line with the trend of the times, is a volume entitled "Chemical French" by Dr. Maurice L. Dolt (Chemical Publishing Co.). The author seeks to enable students who have little or no previous knowledge of French to read chemical literature in that language through the medium of this volume and, accordingly, includes instruction in grammar in the earlier portions. The latter portion is devoted to selections from standard and current journal literature. The book contains 398 pages, a length which seems to be somewhat out of proportion in an auxiliary work of this sort; otherwise it is likely to render real service.

H. P. TALBOT

MASSACHUSETTS INSTITUTE OF TECHNOLOGY,

ORGANIZATION OF THE AMERICAN SECTION OF THE INTERNATIONAL GEOPHYSICAL UNION. II

The first general meeting, for preliminary organization, of the American Section of the

proposed International Geophysical Union, was held in three sessions on June 24 and 25, 1919.

FIRST SESSION

The sad loss sustained by the section in the death of Professor Joseph Barrell was announced by the acting chairman, Mr. Wm. Bowie.

The acting chairman made a brief statement concerning the purpose of the section, and gave a short sketch of the several meetings previously held in connection with founding the section.

The following business was transacted.

It was decided that the officers and members of the section, and of the Provisional Executive Committee, temporarily appointed in the section by the Division of Physical Sciences, and by the Provisional Executive Committee, shall stand and hold office until the meeting of the section for permanent organization after the Brussels conferences, which have been scheduled to begin July 18, 1919.

The section accepted the proposal of the Division of Physical Sciences that it act as the Committee on Geophysics of the division.

The section is concerned with national as well as international problems in geophysics.

For the purpose of accomplishing the objects of the section the Executive Committee is authorized to appoint from time to time special committees to deal with problems of national or international character.

In the permanent organization of the American Section there shall be a chairman, a vice-chairman, a secretary, and an executive committee, of which the three officers mentioned above shall be ex-officio members.

The members of the section who go to the Brussels meeting are constituted a committee, with power to add to its membership, to consider permanent organization of the section. After preparing a plan for organization this committee is to report to a meeting of the section, to be called at the discretion of the acting chairman, for the purpose of perfecting the permanent organization.

A committee of three, consisting of Messrs. Brown, chairman, Hayford and Humphreys,

was appointed to make recommendations to the section for increasing its membership by the addition of men of science engaged in geophysical work or work in affiliated subjects, who would strengthen the section and provide cross-connections with various branches of science in which the section is directly interested.

The statements in regard to the past history, present status and scientific purposes of the specified international scientific organizations were presented and accepted.

After a brief discussion it was found to be the sense of the meeting that neutrals should be admitted to the International Geophysical Union.

Attention was called to certain international organizations not previously specified in the discussions of the committee which it was thought desirable to have affiliated with the International Geophysical Union.

The following delegates and alternates recommended for election by the Executive Committee were approved and elected:

Messrs. L. A. Bauer, Wm. Bowie, A. O. Leuschner, G. W. Littlehales, C. F. Marvin, H. F. Reid, H. C. Graves, J. T. Watkins, Captain Edward Simpson, the three latter also being delegates to the London Hydrographic Conference; and as alternates, Messrs. W. J. Humphreys, J. F. Hayford, W. J. Peters.

A report of the Committee on Variation of Latitude, carrying the following recommendations, was approved:

1. That the observations for variation of latitude, their reduction, and their publication be intrusted to the International Astronomical Union.

2. That the continuity of the observations by the present methods at the four international variation of latitude stations, Ukiah, California; Carloforte, Italy; Mizusawa, Japan, and Charjui, Turkestan; be maintained, as far as practicable, and that the matter of utilizing the observations made at other stations be considered.

3. That the question of renewing variation of latitude observations in the southern hemisphere be considered.

4. That, inasmuch as no definite plan can be advanced for defraying the expense of the variation

of latitude work until some international arrangement is formulated, the several nations maintain the stations within their domains, and that some provisional arrangement be made for caring for the records, reductions and publications, pending a permanent organization of the work.

A report of the Committee on Publications, carrying the following recommendation, was approved:

That all *Titles* in geophysical subjects should be printed in *Science Abstracts*, Section A (Physics), probably best under a special, appropriately entitled section, with *abstracts* of all papers suitable for this journal and drawn up in accordance with the procedures uniform in it.

The appointment of Messrs. Michelson, chairman, Chamberlin, Moulton as a Committee on the Investigation of Earth Tides was approved.

The question of the formation of a separate group, or "sub-section," to represent geochemistry was left to the delegation to Brussels.

The section adopted the plan for voting at Brussels which had been adopted by the American Section of the proposed International Astronomical Union, embodied in the following two motions:

Moved: That it be the sense of the section that on questions of policy which come up in Brussels a caucus be held and the delegation vote as a unit. *Adopted.*

Moved: That it is the opinion of the section if the organization of the union does not conflict that votes on technical matters may be cast by delegates designated by the chairman. *Adopted.*

A suggestion presented by letter from Dr. W. F. G. Swann, regarding the position of "terrestrial electricity" in the subdivision of the geophysical field was referred for consideration to the meetings at Brussels.

A report of the Committee on the Investigation of Earth Tides was read, discussed, approved and referred to the delegation for presentation to the Brussels meeting. This report is included here as an appendix.

Messrs. Henry G. Gale and Wm. D. MacMillan were added to the Committee on the Investigation of Earth Tides.

SECOND SESSION

Joint Session with American Section, International Astronomical Union.

The meeting was presided over by Mr. W. W. Campbell, chairman of the American Section, International Astronomical Union.

Dr. R. S. Woodward addressed the meeting on the general aspects of geophysics and its affiliations and subsequently prepared an abstract of his remarks for the use of the delegation at Brussels.

There was a brief general discussion of the functions of the delegation abroad and of the need of guarding as effectively as possible against legislation tending to exclude any legitimate interests from the international organizations.

Mr. Leuschner gave an account of the origin, relationships and functions of the proposed international cooperative efforts, the progress made toward reorganization, and the further effort required.

The chairman of the American delegates, Mr. W. W. Campbell, was formally authorized to call joint meetings of the delegations of the Sections in Astronomy and Geophysics at his discretion.

After discussion of the report of the Committees on the Variation of Latitude, it was stated as the sense of the joint meeting that an international committee to deal with problems of variation of latitude should be formed.

THIRD SESSION

The Committee on Nominations for additional members of the section—Mr. Brown, chairman, presented the following names and these gentlemen were elected: Messrs. C. G. Abbot, L. J. Briggs, A. J. Henry, L. M. Hoskins, C. E. Van Orstrand, J. B. Woodworth; and upon nomination from the floor, Messrs. A. G. Mayor, R. DeC. Ward and W. J. Peters were also elected.

For the guidance of the delegates to Brussels the document entitled "Proposals for the Convention for an International Union of Geophysics—Approved by the Council of the Royal Society," was read by paragraph and article and votes of instruction were taken.

Three specific research projects presented by letter by Mr. R. A. Daly were then considered, which may be briefly entitled: "(1) A Systematic Thermometric Study of the Gulf Stream, (2) Improving of the Deep Sea Thermograph, and (3) Continued Study of the Composition of Volcanic Gases." These were referred to the Executive Committee.

A brief outline of a statement of the problems of seismology was given by Mr. Wood. This document was referred to the delegation to Brussels and to the Executive Committee.

Mr. Bowie read a brief statement on isostasy and its relationships.

Mr. Bigelow made mention of work planned for exploration in the North Atlantic and the desirability of having this undertaking affiliated with the International Geophysical Union.

Mr. Marvin made reference to the need of centralization in the work of meteorological bureaus, and internationally.

HARRY O. WOOD,
Acting Secretary

APPENDIX: REPORT OF THE COMMITTEE ON INVESTIGATION OF EARTH TIDES

To the American Section of the International Geophysical Union:

Your Committee on Earth Tides begs to report as follows:

1. *Recommendation.*—It is recommended that earth-tide experiments be carried out as soon as possible at stations in (1) Pasadena, California; (2) some island in the central Pacific; (3) the interior of Argentina; (4) England; (5) the interior of Africa; and also, if possible, (6) the interior of India; (7) Japan; (8) Italy; and (9) near Hudson's Bay. It is recommended that the method be that employed at Williams Bay, Wis., in 1915-16, and that the experiments extend over a period of one year.

The reason for the recommendation that the experiments be carried out both inland and near the coast is that it is desired to determine and to eliminate the efforts of the ocean tides on the general tidal deformations of the earth. The reason for the recommendation that two stations be in the southern hemisphere, is that it is desired to determine whether or not the two hemispheres of the earth differ in their deep interiors as they do in their surface features.

2. *Results to be Obtained.*—The proposed ex-

periments will determine the magnitudes of the tidal deformations of the earth of various periods from the semi-daily to the semi-annual within about one tenth of one per cent., and will determine the phases of the principal tides within one minute of time. These results are of an order of accuracy that leaves nothing to be desired. It is possible to determine from the magnitudes of the earth tides the stiffness of the earth, considered as a whole, with a corresponding degree of accuracy; and to determine from the phase relations of t tides to the tide-raising forces whether the earth yields as a viscous or as an elastic body, or to what extent it is elastico-viscous, to use Sir George Darwin's term.

The foregoing results are deemed important for the following reasons:

(a) They give reliable information about hitherto almost unknown properties of the earth.

(b) They throw some light on the effects of enormous pressures on the properties of matter.

(c) They enable us to determine accurately the present rate of tidal evolution.

(d) They give the geologist a secure basis for theories regarding earth deformations, at least at the present time.

(e) They have important relations to doctrine of isostasy.

(f) They form a necessary preliminary to a complete treatment of ocean tides.

(g) They are valuable in connection with theories respecting the origin of the earth.

3. *Cost of Experiments.*—The cost of the installation of the necessary apparatus for the experiments will be about two thousand dollars for each station, and the expenses of maintenance for a year and the securing and measuring of the records will be about four thousand dollars additional. That is, the total cost of each station will be about six thousand dollars.

4. *Type of Apparatus and Personnel.*—It is recommended that all stations use apparatus of identical type, namely, that employed at Williams Bay, Wis., in the second series of experiments of 1915-16. This will insure that all the results will be comparable, at least so far as they depend upon the apparatus.

It is recommended that the experiments be carried out simultaneously, or at least that they largely overlap in time, so that any general seismic or other possible disturbances may not lead to erroneous conclusions respecting differences in the properties of the earth in widely different parts.

It is recommended that the stations be so located, if possible that the greater part of the work of securing and measuring the films may be done by local scientists. On the other hand, it is recommended that the installation of the apparatus be supervised by those who have devised it and had experience with it. It is recommended that all the details of securing the records, measuring the films, and making the calculations be entirely homogeneous and under the supervision of those who have already perfected them.

Committee of the American Section of the International Geophysical Union on Earth Tides,

A. A. MICHELSON, *Chairman*,
F. R. MOULTON,
T. C. CHAMBERLIN

SPECIAL ARTICLES

RESEMBLANCES BETWEEN THE PROPERTIES OF SURFACE-FILMS IN PASSIVE METALS AND IN PROTOPLASM. I

IN my recent comparison of protoplasmic transmission with the transmission of activation in passive metals.¹ I reviewed evidence indicating that in both cases the effect is dependent upon the properties of the thin film of impermeable or protective material formed or deposited at the interface between the metal, or the protoplasm, and the adjoining electrolyte solution. In the passive metal the composition and physical properties of this thin layer are such that it is very readily and rapidly altered or removed by the electrochemical action of the local circuits which appear wherever the film is locally interrupted or its permeability increased beyond a certain limit. The originally continuous and homogeneous film (of oxide or oxygen compound) may thus be removed by electrolytic reduction at the local cathode; a new local circuit is then automatically formed at the boundary between this reduced or activated region (where metallic iron is exposed) and the film-covered or passive area beyond, which forms the cathode of the circuit; a similar process is there repeated; and in this manner the active state is propagated over the whole sur-

face of the metal. Similarly in the living system, *e. g.*, nerve-axone (according to the local action theory of protoplasmic transmission), the surface-film or plasma-membrane is locally altered or interrupted in an analogous manner by the action of the local bioelectric circuit formed between the region of excitation and the resting region beyond; at this latter region, where the current (positive stream) of the circuit passes from the protoplasmic surface to the medium, it produces, primarily through some local process of electrolysis, a change—the critical or excitatory change—in the structure and electromotor properties of the surface-film, this change being apparently associated with an interruption of continuity or increased permeability; a new circuit then arises at the boundary between this newly altered or activated area and the adjacent still unaltered area; and by a repetition of this process at each new active-resting boundary as it is formed, a wave of chemical and physical alteration, associated with a local electrical circuit, travels over the surface of the irritable element. This wave constitutes the excitation-wave, or nerve impulse in the case of the nerve-axone. Since by its very nature this wave is always associated with a local electric current, it produces the effects of electrical stimulation wherever it extends, hence also in the irritable structure, *e. g.*, muscle-cell, at which the axone terminates.

This theory postulates an essential similarity in physicochemical properties and constitution between the surface-films of passive metals and the protoplasmic surface-films or plasma-membranes of the irritable living cells or cell-structures. Certain general resemblances are apparent: both types of film are water-insoluble, are formed by chemical alteration (typically involving oxidation) of the surface-layer of the metal or protoplasm, are impermeable or difficultly permeable to the electrolytes of the adjoining solution, and are subject to ready alteration under the influence of electric currents formed by local action. In consequence of this latter condition such films are often unstable and subject to com-

¹ SCIENCE, N. S., 1918, Vol. 48, p. 51; *cf.* also my general article on "Protoplasmic Transmission," *Scientific Monthly*, 1919, Vol. 8, pp. 456, 552.